
Transmutation Physics

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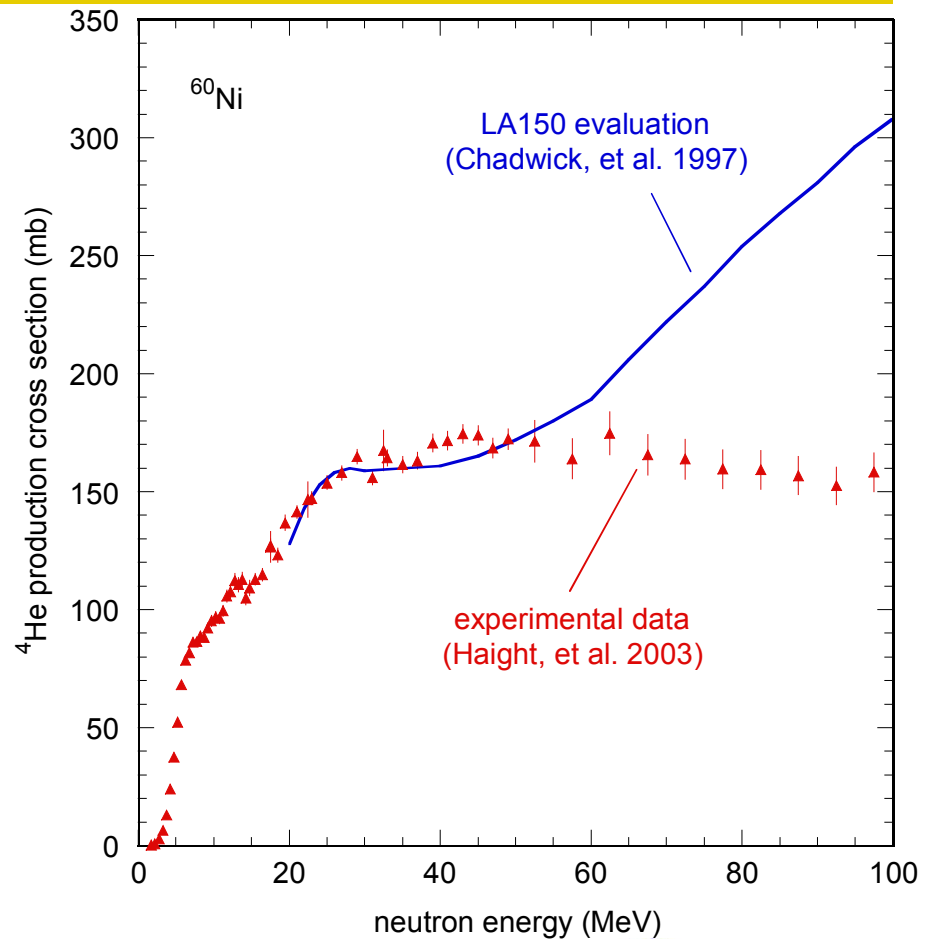
Overview of Activities

- **Nuclear cross section measurements**
- **Nuclear data evaluations**
- **MCNPX code development**
- **MALIBU**
- **International collaborations**
- **University participation**



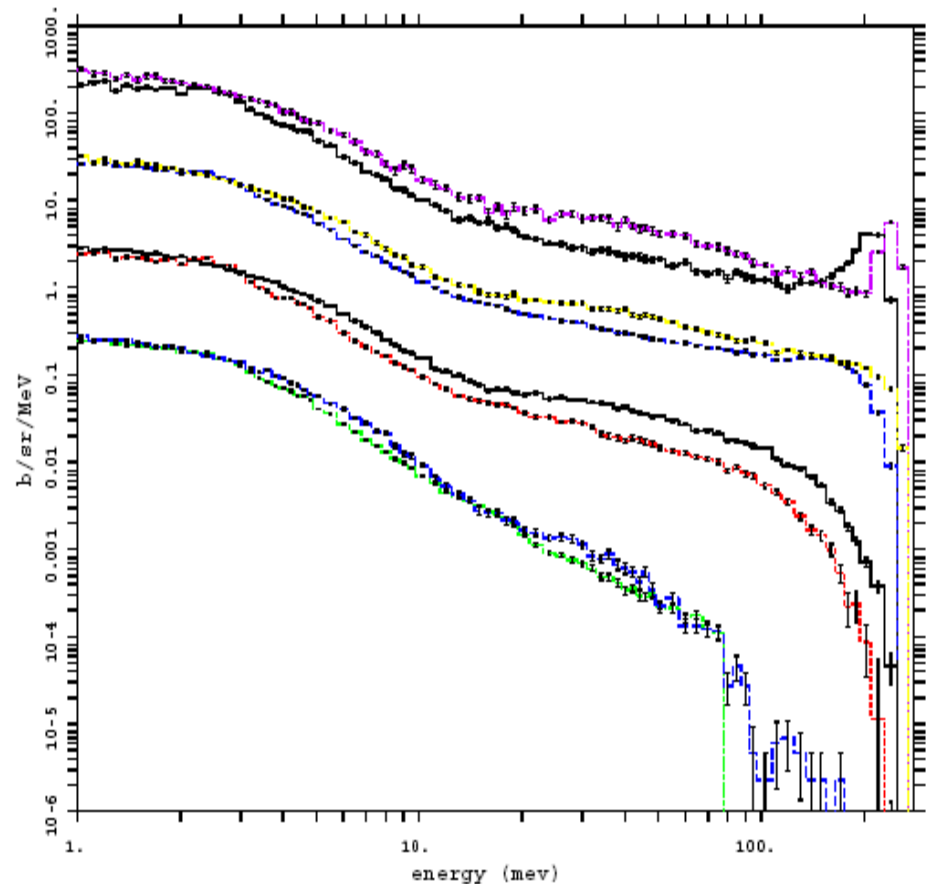
Gas Production Cross Sections

- Measurements made at LANSCE this year show significant discrepancy with nuclear models



New physics models in MCNPX

- Working collaboratively with the CEA, the INCL intranuclear cascade model of Cugnon and the ABLA evaporation model of Schmidt have been incorporated into MCNPX
- Preliminary testing of the model shows it is working as expected



Other major MCNPX accomplishments

- **Released MCNPX Version 2.5.c, with the new features:**
 - message passing interface (MPI) multiprocessing
 - i,j,k lattice indexing on geometry plots
 - weight window generator in physics region
 - exponential transform in physics region
 - extension of neutron physics below 20 MeV
 - ^3He coincidence modeling
 - Numerous corrections and bug fixes
 - double differential cross section calculation and plotting



Future MCNPX Work

- **In-line spallation product yield tally**
- **Contour plotting of mesh tallies with MCPLLOT**
- **Compilation Graphical User Interface**
- **Next-event estimator above the tabular region for neutral particles**



Nuclear Data Evaluations

- **Priority list for evaluation work on minor actinides, based on:**

- isotope prioritization work performed in 2001
- ANL sensitivity studies (Palmiotti, Finck, Aliberti, Salvatores)

<u>FY03:</u>	^{237}Np , ^{241}Am
<u>FY04:</u>	^{243}Am , $^{242\text{m}}\text{Am}$, $^{242\text{g}}\text{Am}$
<u>FY05:</u>	$^{243-245}\text{Cm}$
<u>FY06:</u>	$^{238,240,241}\text{Pu}$
<u>FY07:</u>	$^{242,244}\text{Pu}$, ^{242}Cm , ^{238}Np

- **Am-241**
 - Improved fission and (n,2n) cross sections; metastable/g.s. production ratio
- **Np-237**
 - Improved fission cross section based on latest $^{235}\text{U}(\text{n},\text{f})$ cross section
- **Update LA150 evaluations of Ni-58,60 based on recent LANSCE data**



University Research Activities

- **Accelerator-driven subcritical experiments (IAC + UT +TA&M)**
- **Subcritical system kinetics and dynamics (U of Michigan)**
- **Radiation damage library (North Carolina State University)**
- **Doppler coefficient measurement assessment**
- **Participation in the fission and capture cross section measurement program**

